

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII • EXAMINATION – WINTER 2013

Subject Code: 170603**Date: 07/12/2013****Subject Name: Structural Design - I****Time: 10:30 TO 01:30****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of IS:456, SP16, IS:800 and Steel Tables is permitted.
5. Assume yield stress of steel as 250 MPa and ultimate stress as 410 MPa unless mentioned otherwise for Steel Design.
6. Use concrete of grade M25 and steel of grade fe415 unless mentioned otherwise for R. C. C. Design.

- Q.1** (a) Discuss the various philosophies of the design in R. C. C. and steel structures. Also discuss the merits and demerits of each. **07**
- (b) Discuss the procedure for the design of beam subjected to combined bending and torsion in concrete. **07**

- Q.2** (a) Discuss the procedure for the design the steel member subjected to combined axial and bending loading. **07**
- (b) A steel column ISMB500 is loaded by the factored axial compressive load 1000kN. Design the suitable slab base foundation for the column if it is resting on the M20 grade of concrete. **07**

OR

- (b) Design an isolated sloped footing for the column of size 300mmx400mm reinforced with 8 bars of 16mm diameter carrying an ultimate load of 1000kN. The safe bearing capacity of soil is 180kN/m². Assume effective cover for bottom steel is 60mm. **07**

- Q.3** (a) A truss member is analyzed and found that following loads are acting on it. 1) Dead Load = 100kN (Tension) and 2) Live Load = 75kN (Tension). If the length of the member is 2.0m between the connections and is connected to the 8mm thick gusset plate, design the member comprising of 2 unequal angle sections longer leg connected to gusset plate. Assume that the member is connected to gusset plate by 7 nos. 16mm bolts. **09**

- Q.3** (b) A steel column comprising of two ISMC300 forming a rectangle of 300mmx300mm. It has total length of 4.5m and is restrained against both rotation and translation at bottom end and restrained against translation only at upper end. Calculate the maximum factored load that can be applied on the same. **05**

OR

- Q.3** (a) A tension member comprises of the single angle ISA8080 x 8mm is connected by 7 nos. of 16mm dia. Bolt to the 10mm thick gusset plate. Calculate the tensile load capacity of the member. Take edge distance as 30mm and pitch as 50mm for bolt connection. **09**

- Q.3** (b) A simple support column has length of 6.0m between supports. It is fabricated from ISMB550. Calculate the maximum compression working load capacity of the column. **05**

- Q.4 (a)** A simply supported R. C. C. beam of span 7m carries working udl of 40kN/m throughout the span. Design the beam for bending reinforcement only assuming the width of the beam as 230 mm, effective cover as 45 mm and main steel bars of dia. 20 mm. **07**
- (b)** Design a simply supported one way R. C. C. slab with clear span of 3m X 7m. Assume the live (Imposed) load as 4kN/m² and floor finish load as 1kN/m². **07**

OR

- Q.4 (a)** An R. C. C. beam of size 300 wide and 600mm deep is reinforced by tension bars as 5nos. of 25mm dia. and compression bars as 3nos. of 20mm dia. Calculate the moment of resistance of beam if the clear cover is 25mm on both the sides. **07**
- Q.4 (b)** Design a two way slab continuous over all four sides having span of 3m X 4.5m. Assume the live (Imposed) load as 2.5kN/m² and floor finish load as 0.75kN/m². **07**

- Q.5 (a)** A simple support beam is laterally supported over the span of 6m and loaded by a all inclusive factored udl of 30kN/m over the entire span and 100kN and centre. Design the beam using ISMB section and check for all the safety. **07**
- (b)** An R. C. C. beam has cross section of 230 X 500mm deep is reinforced by 4-16mm bars in tension zone. If it is loaded by factored shear force of 500kN, design for the appropriate vertical shear reinforcement with 8mm dia. bars. **07**

OR

- Q.5 (a)** A beam of ISMB600 has simple support span of 9m and is strengthened by cover plates of size 300x10mm thick on both the faces. Assuming that it is laterally supported over entire span, calculate the maximum factored udl that can be applied on it. **07**
- (b)** An R. C. C. T-beam has breadth of flange as 1100mm, thickness of flange 120mm, effective depth 600mm and width of web 230mm. It is reinforced by 4-25mm dia. bars. Calculate the ultimate moment of resistance for the same. **07**
